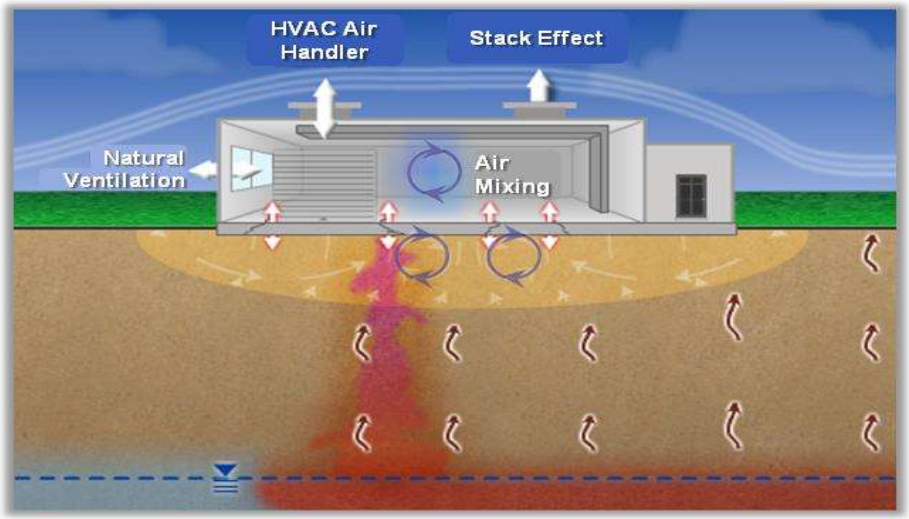
Guidance on Department of Navy's Vapor Intrusion Sampling and Analysis Plan: Using the Residential Quantitative Decision Framework



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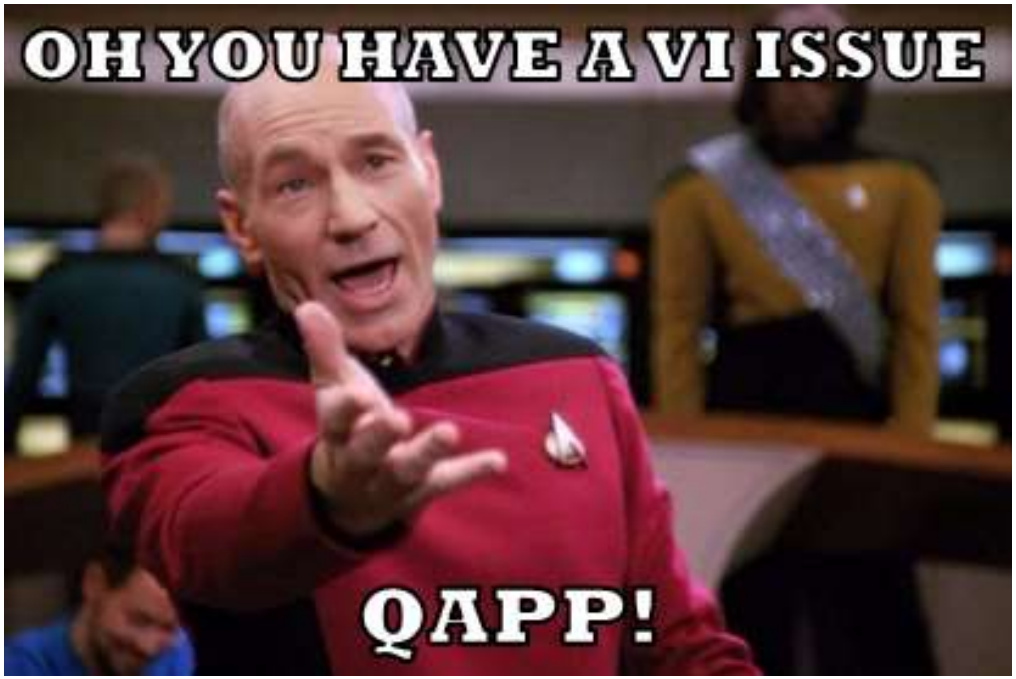
Objective

- DoD VI QAPP Template
- VI Quantitative Decision Framework (QDF)
- Residential QDF
  - Basis for the Residential QDF
- How to use the Residential QDF
  - Flow chart
  - Scorecard
  - Interpretation Keys

DoD VI-QAPP Template

- **Based on Uniform Federal Policy for Quality Assurance Project Plans**



Illustration

DoD VI-QAPP

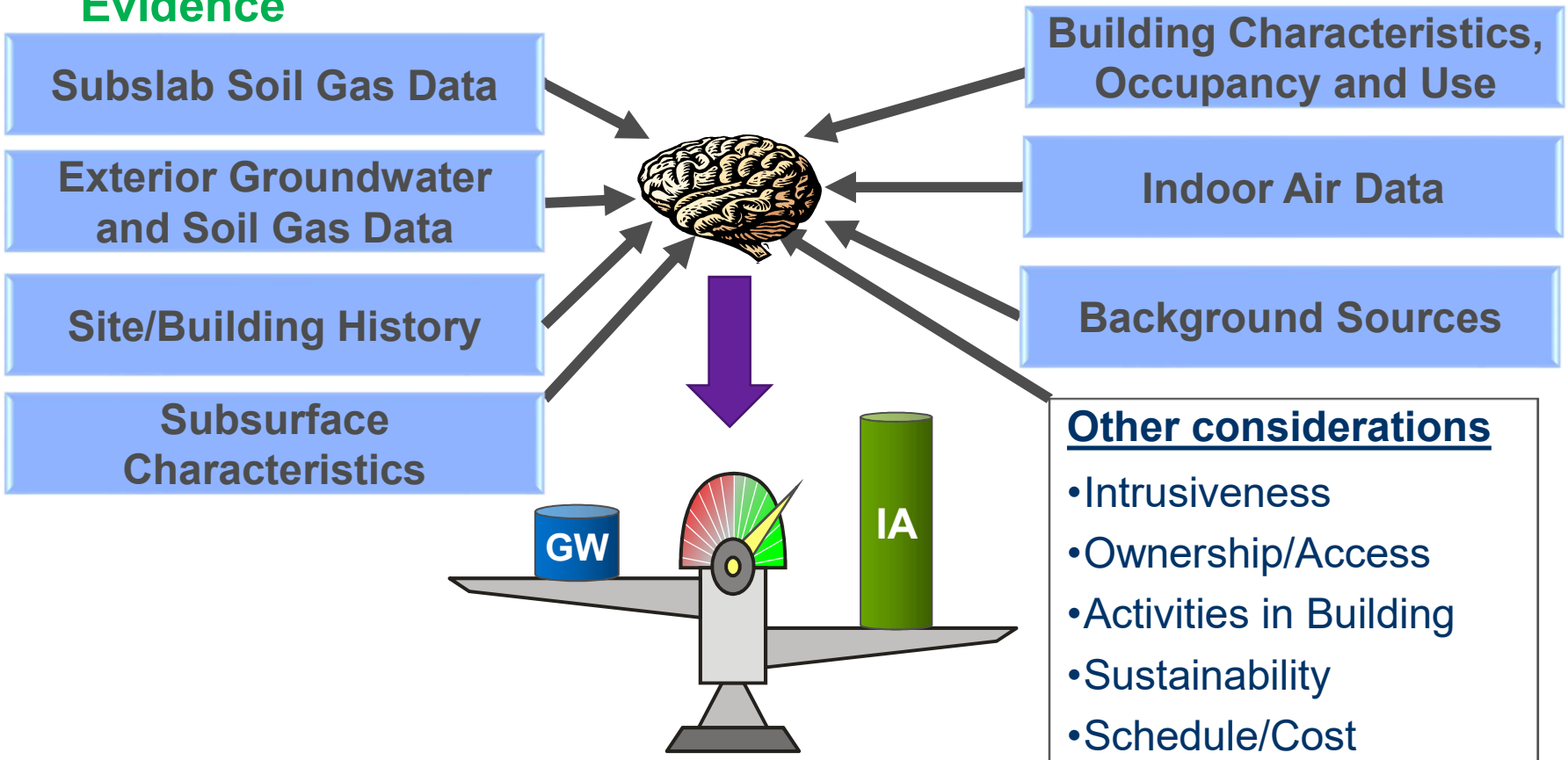
- Uses a comprehensive flowchart to walk the user through VI assessment process
- Integrates VI Quantitative Decision Framework (QDF) into the process
- Guides development of site-specific conceptual site model (CSM) and data quality objectives (DQO) based on a sample scenario
- Establishes method performance criteria (MPC) and QA/QC procedures based on DQOs
- Guides selection of appropriate and proven sampling/analytical tools based on MPCs

Vapor Intrusion QAPP Flowchart

1. Identify triggers that require considering VI
2. Determine if acute/rapid response conditions are present
3. Assemble existing data and preliminary CSM, list buildings, indicators of potential atypical preferential pathways
4. Define preliminary investigative area
5. Apply preliminary QDF to evaluate VI potential, screen out lowest risk buildings
6. Conduct building survey for occupancy, indoor sources etc.
7. Apply QDF scorecard to prioritize buildings
8. Identify data gaps, develop QAPP
9. Collect field data (i.e sub-slab soil gas, pressure differential, indoor air)
10. Update CSM, as additional data needed
11. Apply QDF Decision Matrix during decision making
12. Incorporate in overall CERCLA process

EPA Weighing Multiple Lines of Evidence

- **Simultaneously weigh *multiple lines of evidence***
- **EPA wants concordance, but doesn't explain how to assess**
- **Understand evidence strengths and limitations in the context of CSM and building characteristics**
- **Key Message: QDF is a way to Weigh Multiple Lines of Evidence**



Commercial/Industrial QDF

- Overview and latest version in:

DoD Vapor Intrusion Handbook Fact Sheet Update No: 007: Screening and Prioritization for Vapor Intrusion Assessments

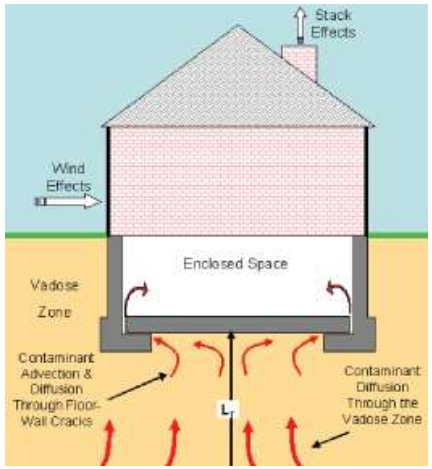
- Based on DoD DoD Industrial Building Database Analysis

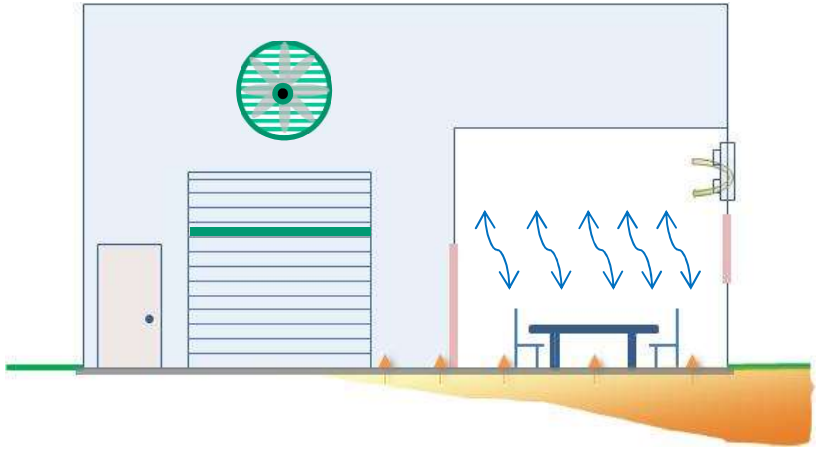
- Final Report from NESDI Project #476 includes Appendix H: User's Quick Start Guide

http://www.nesdi.navy.mil/Files/FinalReports/FR_476.pdf

Differences Between Residential and Commercial/Industrial Buildings

- **Residential & industrial buildings behave differently with respect to VI**





Residence:

- **Can be basement, crawl space or slab on grade**
- **Smaller space**
- **Large ratio of building envelope area to volume**

Industrial Building:

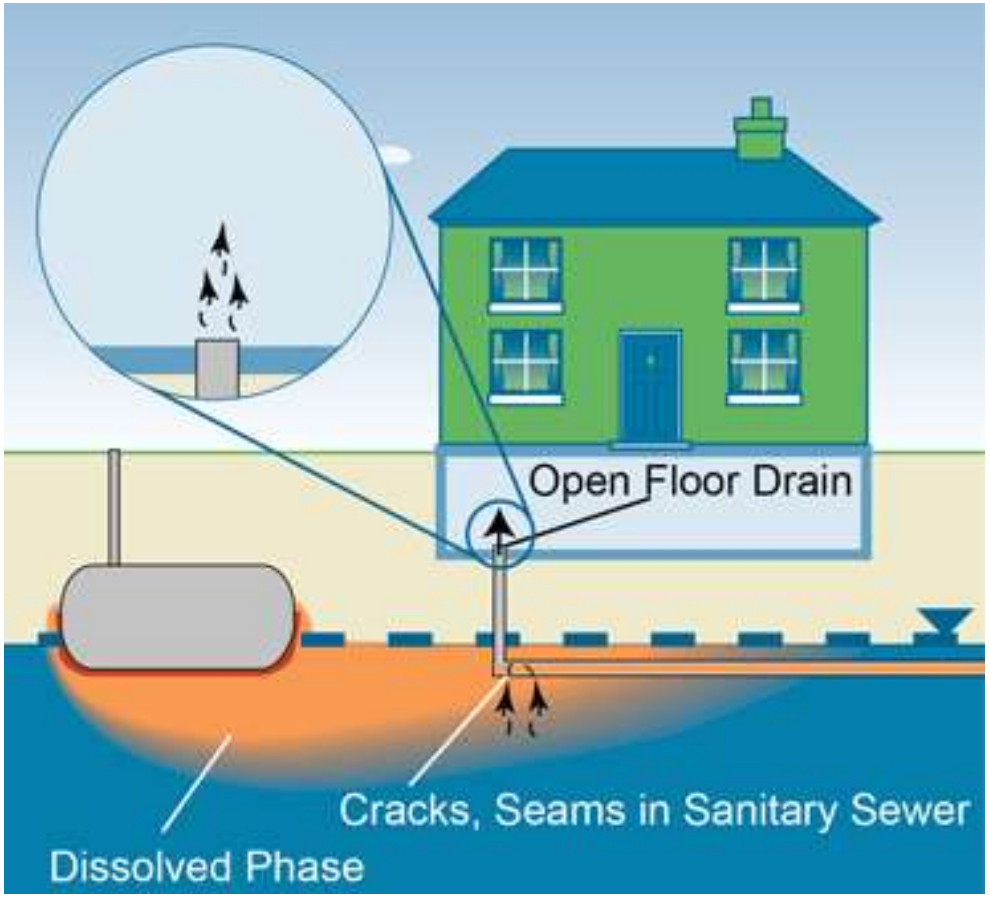
- **Usually Slab-on-grade**
- **Often open work bays**
- **Large wall fans, open doors; and/or HVAC always on = Greater dilution of VOCs**
- **Smaller ratios of building envelope area to volume**

Residential QDF Basis/Methodology

- Used EPA vapor intrusion database (EPA 530-R-10-002)
- Focused on chlorinated VOCs- not petroleum VI
- Evaluated known predictors of spatial variability
- Used predictors to develop residential scoring system to prioritize building-to-building.

Results of Literature & Data Reanalysis for Residential Buildings

- Subslab concentration
- Groundwater concentration
- Soil type
- Atypical Preferential Pathway connecting to distant contaminate source
- Depth to impacted groundwater
- Presence of subslab gravel layer

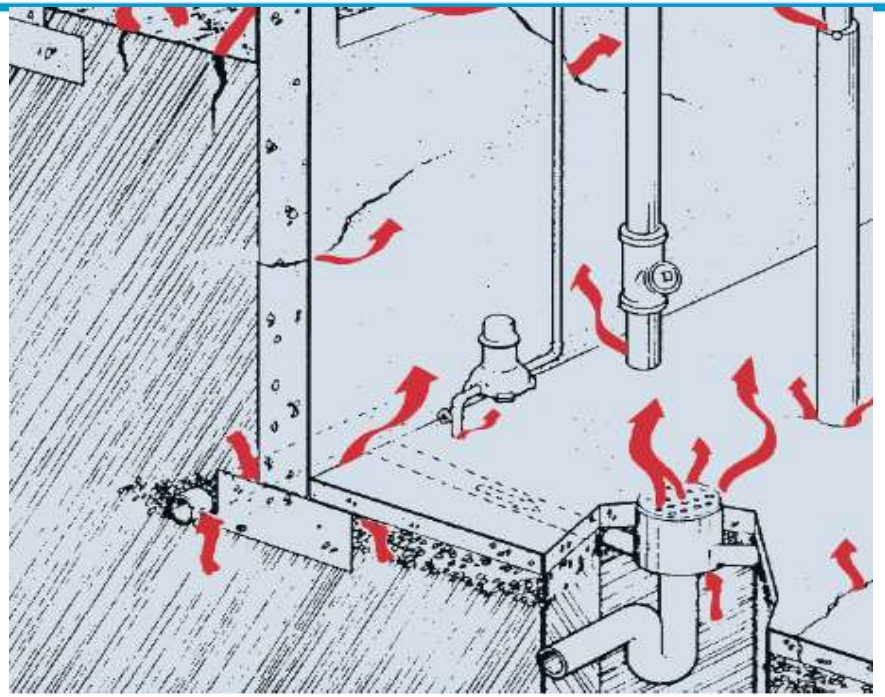


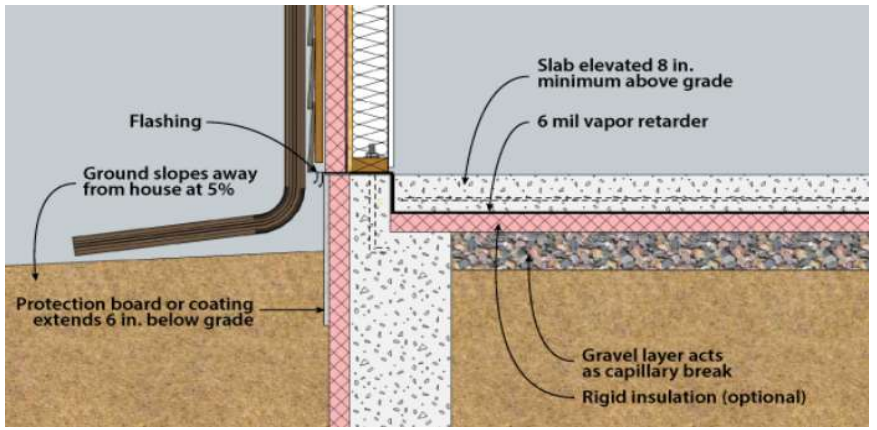
ITRC PVI, 2014

Subslab Gravel Layer Beneath Floor

- **Why care? High volume contaminated soil gas entry is facilitated by a gravel layer.**
- **How to identify? Plans, codes, observations during subslab port installation.**
- **For distant GW source, gravel layer may reduce exposure (dilution)**
  - **only take gravel into account if scoring with subslab data.**

Key point: High subslab concentration is a bigger problem for gravel then clay (<<< permeability).

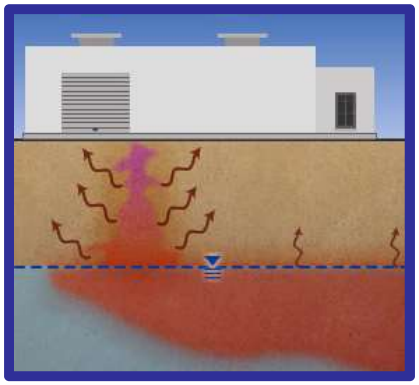




Images reproduced from http://foundationhandbook.ornl.gov/handbook/section4-1.shtml and "Radon: A Guide for Canadian Homeowners" Health Canada

How the Quantitative Decision Frameworks Were Prepared

INPUTS



DoD Commercial/ Industrial VI Data Base

EPA VI Database

Literature

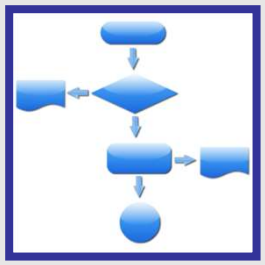
Data Analysis

KEY FACTORS

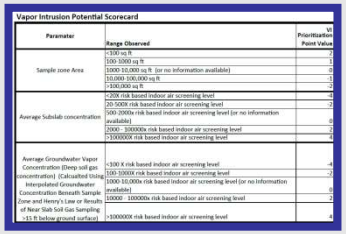
- Subslab Conc.
- Groundwater Conc.
- Soil Type
- Distance to Release
- Preferential Pathways
- Sample Zone Area

Data Interpretation

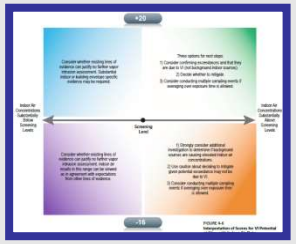
TOOLS



Flowcharts

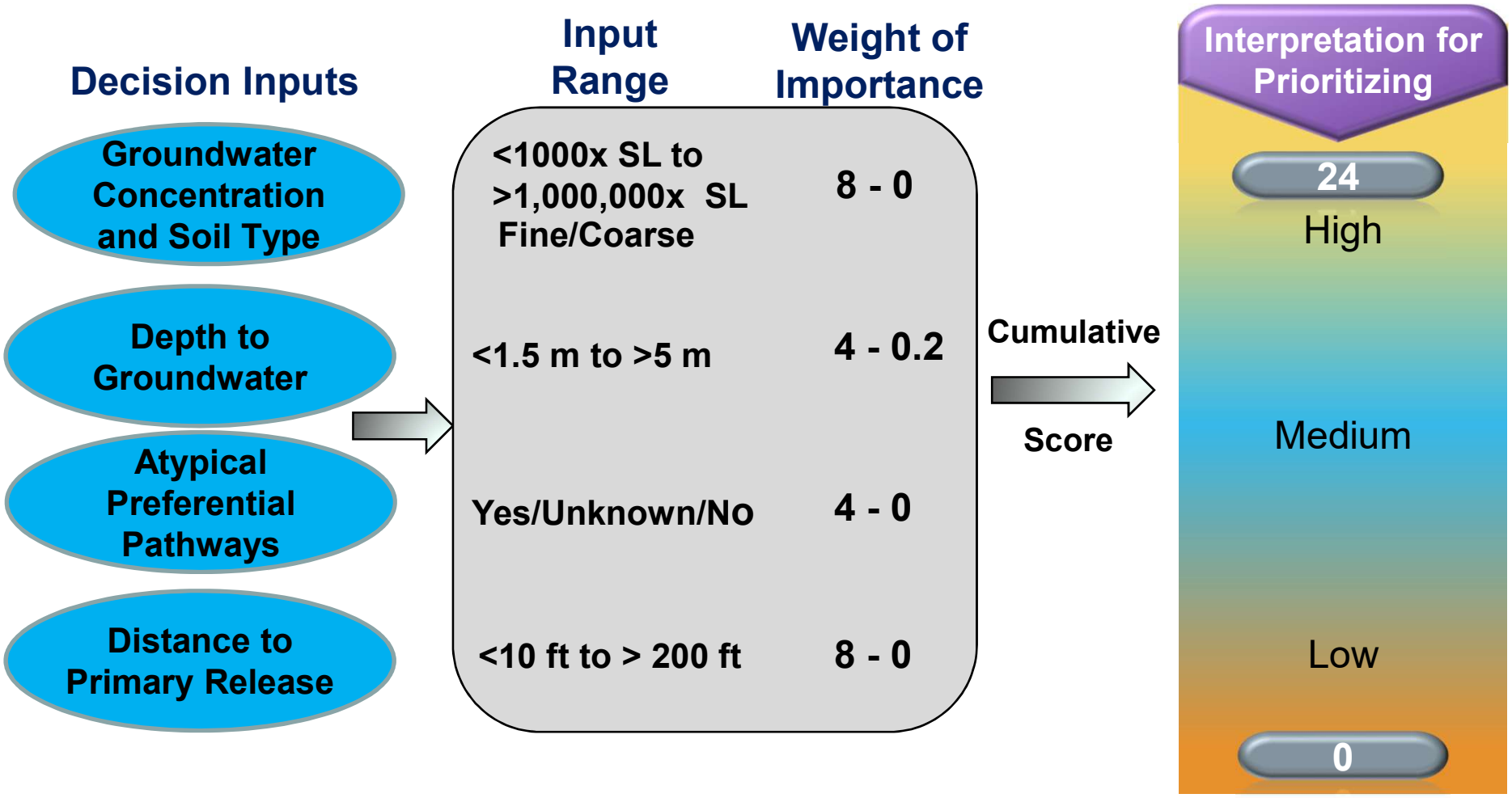


Scorecards

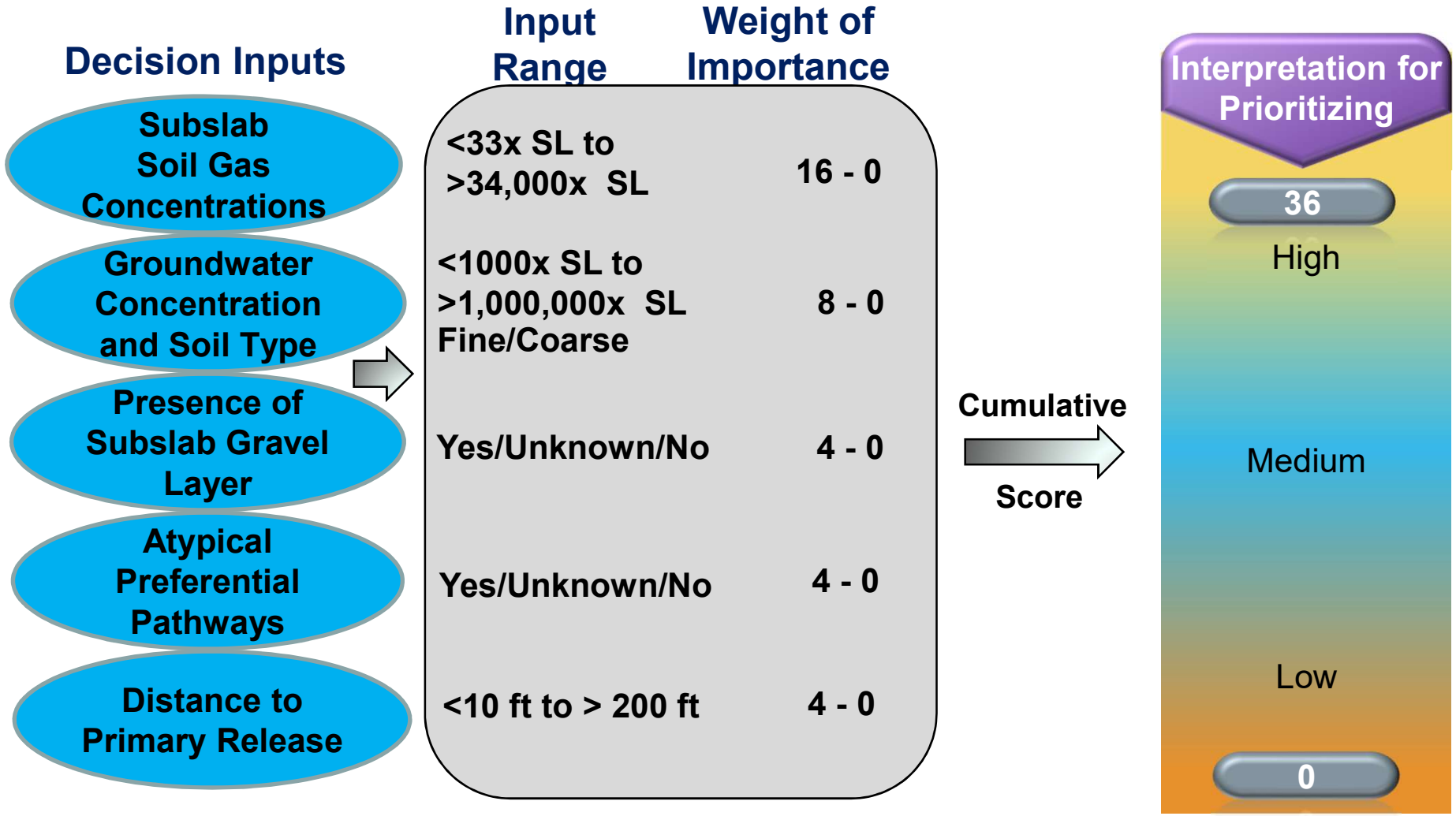


Decision Matrices

Residential Prioritization Groundwater Data Only Available



Residential Prioritization
Subslab and Groundwater Data Available



Knowledge Check

1) The QDF Guides development of site-specific conceptual site model (CSM) and data quality objectives (DQO) based on a sample scenario.

TRUE

2) The QDF should not be used for gathering multiple lines of evidence.

FALSE

3) High subslab concentration is a bigger problem for gravel then clay .

TRUE

Summary

- Vapor Intrusion Quality Assurance Project Plan (VI QAPP) uses QDF as a unifying feature.
- QDF provides a tool to systematically weigh multiple lines of evidence.
- QDF for residential buildings was developed as a parallel to the existing QDF for commercial/industrial buildings
- QDF can used at multiple stages of VI assessments
  - comparison of relative priority between buildings or zones
  - Interpreting results from VI investigations

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